

1. Background

In the manufacturing of specialty wood products such as oriented strand board controlling cost and quality is paramount. The polymers and adhesives used in manufacturing these boards are costly and the process can make thousands of square feet per hour. Either quick lab results or online measurement of critical parameters brings exceptional process control and cost savings.

In this study six samples of solid wood panels and three samples of powdered wood panels were supplied by a major specialty wood manufacturer. These were used to determine the feasibility of measuring the % of Polymer that was in the finished products.

2. Experimental Section

The IsoChem analyzer (Figure 1) equipped with a reflectance detector. For the powder samples a sample cup was used and for the solid panels the product was placed on the LT universal sampling compartment. The scanning wavelength range was 1200 nm to 2400 nm. A sample spectrum contained an average of 30 scans.

To build the calibration model, the spectra were obtained in non-sequential order with multiple scans of each sample being taken. A spectrum of a ceramic calibration disc provided the background from which absorbance processing was derived.



Figure 1

3. Results and Discussion

Because of improved homogeneity in the powdered samples, they provided the best results as shown below. The solid wood panels showed good results as well, but would benefit from scanning of a larger surface area to average out surface variations.

Modeling was done using Grams Chemometric package. The spectra were processed for first derivative (figure 2). The calibration curve used PLS regression and 3 factors (table 1). The resulting correlation showed an R^2 of 0.976 (figure 3). The resulting leave one out cross validation produced an Standard Error of Cross Validation of 0.38.

# of Samples	12
Modeling Process	PLS
Number of Factors	3
Standard Error of Cross Validation	0.38
R Squared	.976

Table 1

A number of regions of the spectra showed high correlation with the measurement. As seen in the spectra shown in figure 3 the clear separation on these 1st derivative spectra allow for a very accurate and robust model to be developed. Similar spectral characteristics were seen in the solid wood panels.

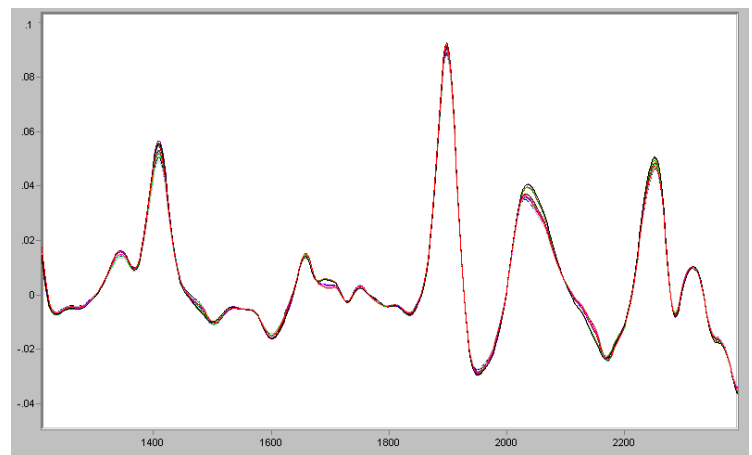


Figure 2

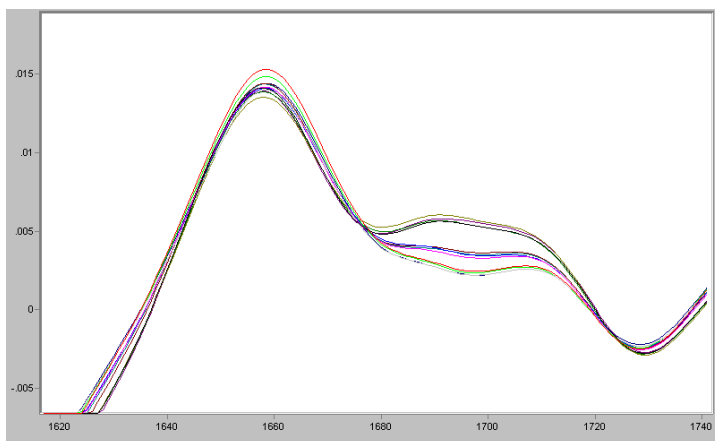


Figure 3

As can be seen in figure 4, the model was able to predict with a great deal of accuracy. Additional samples and offering additional information for modeling would greatly increase the models performance.

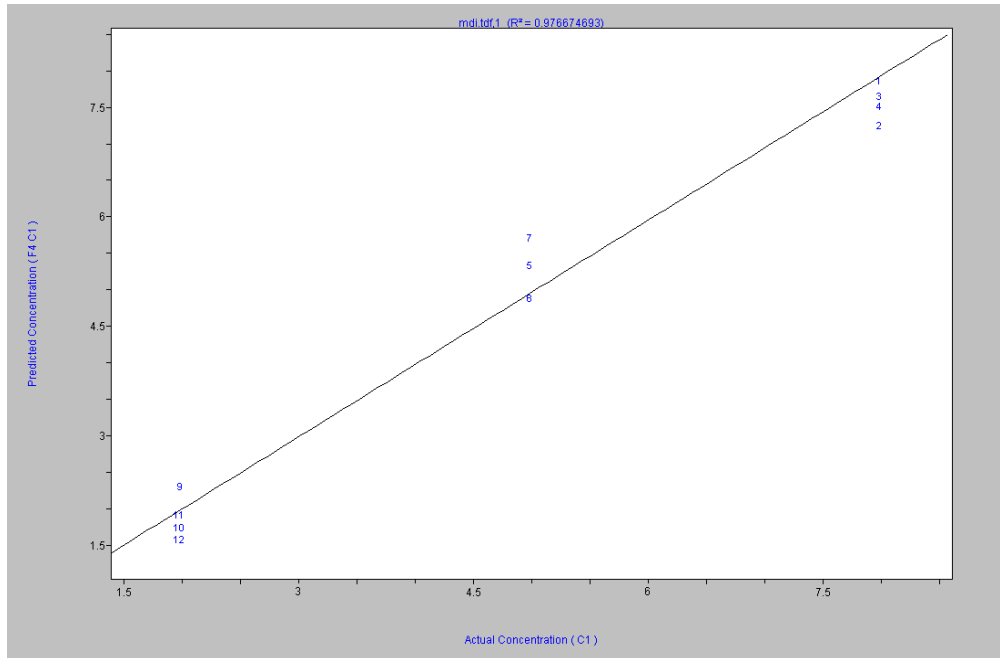


Figure 4

4. Conclusions

The results of this study indicate that the LT-NIR technique is ideally suited for the determination of Polymer in pressed oriented strand board. It offers dramatic improvements in both speed and simplicity to an otherwise complicated and time consuming measurement. The LTNIR analysis takes only a few seconds and can be performed by personnel with no laboratory experience or performed online and in-process.

Accessories such as a rotating sample averager, sample cup, non-contact reflectance probe, and optical multiplexing all offer different approaches to this measurement suitable for different points in the process.